

Practitioner's Docket No. 50807

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): **Eric R. ALLING and Clare R. SOKOLOWSKI**

WARNING: 37 CFR 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): **VIRTUAL ENGINEER**

CERTIFICATION UNDER 37 C.F.R. 1.10*

*(Express Mail label number is **mandatory**.)*

(Express Mail certification is optional.)

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on this date November 20, 2000, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EK929188032US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Deanna M. Rivernider

(type or print name of person mailing paper)

Deanna M. Rivernider

Signature of person mailing paper

WARNING: Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).
"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

☐ Plant

WARNING: *Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: *Do not use this transmittal for the filing of a provisional application*

NOTE. *If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.*

☐ Divisional.

☐ Continuation.

☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. 119(e), 120, or 121)

NOTE. *A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. 112. Each prior application must also be*

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b), or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 CFR 1.78(a)(1)

NOTE *If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.*

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205*

WARNING: *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application **must** be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).*

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for Filing Date under 37 C.F.R. 1.53(b) (Regular) or 37 C.F.R. 1.153 (Design) Application

 8 Pages of Specification (including cover sheet)
 4 Pages of Claims
 5 Sheets of Drawing

☐ Formal
☐ Informal

B. Other Papers Enclosed

 1 Pages of Abstract
 Other

WARNING: ***DO NOT** submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. 1.84, see Notice of March 9, 1988 . . . (1990 O.G. 57-62).*

NOTE: *"Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page." 37 C.F.R. 1.84(c))*

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. 1.84(b).

4. Additional Papers Enclosed

- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement (37 C.F.R. 1.98)
- ☐ Form PTO-1449
- ☐ Citations
- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other:

5. Declaration or Oath

NOTE: *A newly executed declaration is not required in a continuation or divisional application provided the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47 then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 CFR 1.63(d).*

NOTE: *A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and the residence, post office address and country of citizenship of each inventor and state whether the inventor is a sole or joint inventor. 37 CFR 1.63(a)(1)-(4).*

☒ Enclosed

Executed by

(check **all** applicable boxes)

- ☒ inventor(s).
- ☐ legal representative of inventor(s). 37 CFR 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
- ☐ This is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

NOTE: *Where the filing is a completion in the U.S. of an International Application, or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.*

- ☐ Application is made by a person authorized under 37 C.F.R. 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 CFR 1.16(e), can be filed subsequently).

NOTE: It is important that all the correct inventor(s) are named for filing under 37 CFR 1.41(c) and 1.53(b).

- ☐ Showing that the filing is authorized.
(not required unless called into question. 37 CFR 1.41(d))

6. Inventorship Statement

WARNING: If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

- ☐ The same.
- or**
- ☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,
- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 CFR 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 CFR 1.52(d).

- ☒ English
- ☐ Non-English
- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. 1.52(d).

8. Assignment

- ☒ An assignment of the invention to Shibley Company, L.L.C. of
Marlborough, Massachusetts 01752
- ☒ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☒ FORM PTO 1595 is also attached.
- ☐ was filed in the parent application
- ☐ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters—one for the application and one for the assignment" Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: A newly executed "STATEMENT UNDER 37 CFR 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64

9. **Certified Copy**

Certified copy(ies) of application(s)

<u>Country</u>	<u>Appln. No.</u>	<u>Filed</u>

from which priority is claimed

- ☐ is enclosed.
☐ was filed.
☐ will follow.

NOTE. The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 CFR 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. **Fee Calculation (37 C.F.R. 1.16)**

A. ☒ Regular application

CLAIMS AS FILED

Claims	Number Filed	Basic Fee Allowance	Number Extra	Rate	Basic Fee 37 C.F.R. 1.16(a) \$710.00
Total Claims (37 CFR 1.16(c))	14	- 20 =	0	x \$ 18.00	\$0
Independent Claims (37 CFR 1.16(b))	3	- 3 =	0	x \$78.00	\$0
Multiple Dependent Claim(s), if any (37 CFR 1.16(d))			+	\$260.00	\$0

- ☐ Amendment canceling extra claims is enclosed.
☐ Amendment deleting multiple-dependencies is enclosed.
☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

Filing Fee Calculation \$ 710.00

- B. ☐ Design application
(\$330.00—37 CFR 1.16(f))
Filing Fee Calculation \$ _____
- C. ☐ Plant application
(\$540.00—37 CFR 1.16(g))
Filing Fee Calculation \$ _____

11. Small Entity Statement(s)

- ☐ Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is (are) attached.

WARNING: *"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 CFR 1.28(a)(2).*

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application _____, filed on _____ from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.
Filing Fee Calculation (50% of A, B or C above) \$ _____

NOTE: *Any excess of the full fee paid will be refunded if a small entity status is established refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 CFR 1.28(a).*

12. Request for International-Type Search (37 C.F.R. 1.104(d)) *(complete, if applicable)*

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee \$ 710.00

☒ Recording assignment
(\$40.00; 37 C.F.R. 1.21(h))
(See attached "COVER SHEET FOR
ASSIGNMENT ACCOMPANYING NEW
APPLICATION.") \$ 40.00

☐ Petition fee for filing by other than
all the inventors or person on behalf
of the inventor where inventor
refused to sign or cannot be reached
(\$130.00; 37 C.F.R. 1.47 and 1.17(i)) \$ _____

☐ For processing an application with a
specification in a non-English language
(\$130.00; 37 C.F.R. 1.52(d) and 1.17(k)) \$ _____

☐ Processing and retention fee
(\$130.00; 37 C.F.R. 1.53(d) and 1.21(l)) \$ _____

☐ Fee for international-type search report
(\$40.00; 37 C.F.R. 1.21(e)) \$ _____

NOTE: 37 CFR 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 CFR 1.53(f) and this, as well as the changes to 37 CFR 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total Fees Enclosed \$ 750.00

14. Method of Payment of Fees

☒ Check in the amount of \$ 750.00

☐ Charge Account No. _____ in the amount of \$ _____.
A duplicate of this transmittal is attached.

15. Authorization to Charge Additional Fees

WARNING: If no fees are to be paid on filing, the following items should not be completed.

WARNING: Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 04-1105.

- ☒ 37 C.F.R. 1.16(a), (f) or (g) (filing fees)
☒ 37 C.F.R. 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☒ 37 C.F.R. 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
☒ 37 CFR 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).
☒ 37 C.F.R. 1.17 (application processing fees)

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 CFR 1.136(a)(3).

- ☐ 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance 37 CFR 1.311(b)).

NOTE: 37 CFR 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . issue fee." From the wording of 37 CFR 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

16. Instructions as to Overpayment

NOTE: " . . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts, amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 CFR 1.26(a).

☒ Credit Account No. 04-1105.

☐ Refund



SIGNATURE OF PRACTITIONER

Reg. No. 42,378

S. Matthew Cairns
(type or print name of practitioner)

c/o EDWARDS & ANGELL, LLP
Dike, Bronstein, Roberts & Cushman, IP Group

Tel. No.: (617) 523-3400

130 Water Street
P.O. Address

Customer No.:

Boston, MA 02109

[X] Incorporation by reference of added pages

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

[] Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

[] Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

[] Plus added pages deleting names of inventor(s) named on prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

[X] Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added 3

[] **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

[] This transmittal ends with this page.

Express Mail Label No. EK929188032US
Docket No. 50807

U.S. PATENT APPLICATION

Title: **VIRTUAL ENGINEER**

Inventors: Eric R. ALLING
Clare R. SOKOLOWSKI

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c/o EDWARDS & ANGELL, LLP
Dike, Bronstein, Roberts & Cushman, IP Group
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Telephone: (508) 229-7545

U.S. PATENT APPLICATION

VIRTUAL ENGINEER

BACKGROUND

The following invention relates to a method and system for providing engineering support services and, in particular to a method and system for remotely diagnosing and resolving a technical problem associated with a product or service.

Customers of technically sophisticated products and services often require technical support to properly use the product or service. For example, to implement Shipley's ultrafill copper electrolyte electroplating process requires specific engineering expertise. Thus, sellers of technical products and services typically make available engineers and technicians to respond to requests for technical support from their customers. For some support requests, the engineer can determine the underlying problem and implement a resolution remotely, for example through a telephone call with the customer. In many cases, however, in order to properly service the customer, the engineer must observe the problem first hand because the customer is not sufficiently skilled in identifying and describing the symptoms of the problem. In such cases, the engineer must either go to the customer's location or, if feasible, have the product in question shipped to the engineer so that the engineer can correctly diagnose and repair the problem. In either case, however, because qualified engineers are costly to train and maintain, the cost of providing competent technical support is high and is often reflected in increased product costs. More typically, the service provider is not able to staff sufficient qualified engineers which results in inefficient and slow customer support, especially if on-site service is required.

Accordingly, it is desirable to provide a system and method for providing engineering and technical support services to remotely diagnose and resolve a technical problem associated with a technical product or service.

SUMMARY OF THE INVENTION

The present invention is directed to overcoming the drawbacks of the prior art. Under the present invention a method and system is provided for diagnosing a fault and includes a decision tree having a plurality of decision points wherein at least some of the plurality of decision points terminate in a resolution point representing a diagnosis for the fault. Also included is a plurality of queries each having at least a first response and a second response where each of the plurality of queries being associated with one of the plurality of decision points. The system also includes a knowledge base that includes a plurality of first images where each of the plurality of first images illustrate one of the first responses. A user interface is included for presenting the plurality of queries and the illustrative first images to a user. The user navigates the decision tree by responding to at least some of the plurality of queries by viewing the illustrative first images and basing a selection between the first response and the second response associated with said at least some of said queries on said illustrative first images. Finally, the fault is diagnosed when the user navigates the decision tree until the resolution point is reached.

In an exemplary embodiment, the knowledge base includes a plurality of second images where each of the plurality of second images illustrate one of the second responses wherein the user interface presents the illustrative second images to the user so that the user may respond to the at least some of the plurality of queries by viewing the illustrative second images.

In another exemplary embodiment, the knowledge base includes a diagnostic image illustrating the diagnosis of the fault and when the user reaches the resolution point, the user interface presents the diagnostic image to said user.

In yet another exemplary embodiment, the knowledge base includes a resolution of the fault and when the user reaches the resolution point, the user interface presents the resolution to the user.

Accordingly, a user may access the system of the present invention to diagnose and resolve a technical problem associated with a technical product or service by responding to the queries presented to the user by the system with the aid of images that assist the user in identifying the symptoms associated with the technical problem. Once the user responds to all the queries presented by the system, the user is presented with an image of the diagnosed problem, thereby confirming the diagnosis, and a resolution to the technical problem. Thus remote diagnostic and remedial services for technical and engineering problems is provided.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts that will be exemplified in the following detailed disclosure, and the scope of the invention will be indicated in the claims. Other features and advantages of the invention will be apparent from the description, the drawings and the claims.

DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is made to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is block diagram of a system for providing remote diagnostic and remedial services in accordance with the present invention;

FIG. 2 is a drawing of a decision tree for diagnosing faults that is included in the system of FIG. 1;

FIG. 3 is a screenshot of an image depicting a rim void;

FIG. 4 is a screenshot of an image depicting a resist plug void; and

FIG. 5 is a screenshot displaying the likely causes for resist plug voids and recommended remedial actions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, there is shown a system 1 for providing remote diagnostic and remedial services in accordance with the present invention. System 1 includes a knowledge base 3 that stores diagnostic and remedial information. Also included in system 1 is a decision tree module 5 that is in communication with knowledge base 3 and that is used to present the information contained in knowledge base 3 in a diagnostically useful format. In an alternative embodiment, knowledge base 3 and decision tree module 5 are integrated. System 1 also includes a user interface module 7 for providing a user 9 with access to decision tree module 5 and knowledge base 3 of system 1. User 9 may access system 1 using, for example, a personal computer that communicates with system 1 via the Internet according to techniques well known in the art.

Referring now to FIG. 2, there is shown a decision tree 11 that is contained in decision tree module 5 that is used to diagnose a particular fault. Decision tree 11 is made up of a plurality of decision points D(2), D(4), D(6), D(8), D(10), D(20) and D(30), as well as a plurality of resolution points R(12), R(14), R(16), R(18), R(22), R(24), R(26) and R(28). Each of decision points D have associated therewith a query designed to identify a symptom of the fault thereby leading to an eventual diagnosis. Each query has associated therewith a number of potential responses to the query from which user 9 may choose where each of the responses identifies a possible symptom of the fault. In order to guide user 9 in identifying the correct symptoms and thus choosing the appropriate response, an image illustrating each of the

symptoms associated with the responses is retrieved from knowledge base 3 and displayed to user 9. By comparing the visual symptoms of the fault to be diagnosed to the images associated with each response, user 9 is aided in identifying the symptoms of the fault and selecting the correct response to the query. Thus, by navigating decision tree 11 to a resolution point R with the guidance of illustrative images, a diagnosis of the fault can be made without necessarily requiring an engineer to observe the fault first hand.

For example, if user 9 is using system 1 to diagnose a defective circuit board, then the query associated with decision point D(30) may be directed to determining what type of void defect the circuit board has. Associated with the query of decision point D(30) are two potential responses -- a rim void or a resist plug void -- from which user 9 may select as a response to the query. Displayed to user 9 are images 1 and 3, shown in FIGS. 3 and 4, respectively, that are stored in knowledge base 3 and which illustrate to user 9 the appearance of a rim void and a resist plug void, respectively. By comparing the defective circuit board to images 1 and 3, user 9 can more accurately determine which type of void defect has caused the circuit board to fail. Based on the comparison, user 9 will either navigate decision tree 11 to resolution point R(24) or R(26) at which point the type of defect causing the circuit board to fail will have been uniquely identified as either a rim void or a resist plug void.

Thus, decision tree 11 is constructed so that once navigation of decision tree 11 reaches a resolution point, sufficient symptoms have been provided to uniquely identify the fault. In addition, upon reaching a resolution point, a diagnostic image illustrating the fault is retrieved from knowledge base 3 and displayed to user 9 so that user 9 can visually confirm that the diagnosis is correct. Also retrieved from knowledge base 3 and provided to user 9 is information describing the likely causes of the diagnosed fault as well as the resolution of the fault. For

example, if navigation of decision tree 11 resulted in a diagnosis that a resist plug void was the cause of board failure, then displayed to user 9, as shown in FIG. 5, are the likely causes for resist plug voids and recommended remedial actions. Accordingly, by navigating decision tree 11 and reaching a resolution point, user 9 is presented with a diagnosis of the fault in question, a diagnostic image illustrating the fault, likely causes of the fault and recommended remedial actions.

The diagnostic information may be presented to user 9 in any suitable manner in which user 9 can reach a resolution of the fault to be diagnosed. For example, decision tree 11 may be constructed to include decision points having queries with more than two possible responses from which to choose with an image illustrating each response. Also, in certain situations where the diagnosis of the fault is complex, user 9 may be required to traverse several decision points to reach a resolution point and thus determine the cause and remedy of the fault. In addition, system 1 may present to user 9 all the resolution points and allow user 9 to compare the fault to be diagnosed to the illustrative images associated with each of the resolution points so that user 9 can directly diagnose the fault without having to respond to queries for traversing decision tree 11. The diagnostic information contained in knowledge base 3 may similarly be arranged and presented to user 9 in any manner that enables user 9 to diagnose the fault in question.

Accordingly, a system and method is provided to remotely diagnose and resolve a technical problem associated with a product or service. By using the system and product of the present invention, remote diagnosis and remediation is provided while eliminating, or greatly reducing, the need for technical personnel to actively participate in the technical support process.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in

carrying out the above process, in a described product, and in the construction set forth without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

CLAIMS

1. A system for diagnosing a fault, comprising:
 - a decision tree having a plurality of decision points wherein at least some of said plurality of decision points terminate in a resolution point representing a diagnosis for said fault;
 - a plurality of queries each having at least a first response and a second response, each of said plurality of queries being associated with one of said plurality of decision points;
 - a knowledge base, said knowledge base including a plurality of first images, each of said plurality of first images illustrating one of said first responses; and
 - a user interface for presenting said plurality of queries and said illustrative first images to a user;wherein said decision tree is navigated by said user responding to at least some of said plurality of queries by viewing said illustrative first images and selecting between said first response and said second response associated with said at least some of said queries, and said fault is diagnosed by said user navigating said decision tree until said resolution point is reached.
2. The system of claim 1, wherein said knowledge base includes a plurality of second images, each of said plurality of second images illustrating one of said second responses wherein said user interface presents said illustrative second images to said user and said user responds to said at least some of said plurality of queries by viewing said illustrative second images.
3. The system of claim 1, wherein said knowledge base includes a diagnostic image illustrating said diagnosis of said fault wherein when said user reaches said resolution point, said user interface presents said diagnostic image to said user.

5. The system of claim 1, wherein said knowledge base includes a description of said fault and wherein when said user reaches said resolution point, said user interface presents said description to said user.

6. The system of claim 1, wherein said decision tree includes a plurality of resolution points each representing a diagnosis for one of a plurality of faults, and wherein said knowledge base includes a plurality of diagnostic images, each of said plurality of diagnostic images illustrating said diagnosis for one of said plurality of faults, wherein said fault is diagnosed by said user viewing at least some of said plurality of diagnostic images and selecting said resolution point representing said diagnosis of said fault.

7. A system for diagnosing a fault, comprising:

a plurality of resolutions points, each of said plurality of resolution points representing a diagnosis for one of a plurality of faults;

a knowledge base including a plurality of diagnostic images, each of said plurality of diagnostic images illustrating said diagnosis for one of said plurality of faults,

wherein said fault is diagnosed by viewing at least some of said plurality of diagnostic images and selecting said resolution point representing said diagnosis of said fault.

8. The system of claim 7, wherein said knowledge base includes a resolution of said fault and wherein when said resolution point representing said diagnosis of said fault is selected, said resolution of said fault is output by the system.

9. The system of claim 7, wherein said knowledge base includes a description of said fault and wherein when said resolution point representing said diagnosis of said fault is selected, said description of said fault is output by the system.

10. A method for diagnosing a fault using a system, said system including a decision tree having a plurality of decision points wherein at least some of said plurality of decision points terminate in a resolution point representing a diagnosis for said fault; a plurality of queries each having at least a first response and a second response, each of said plurality of queries being associated with one of said plurality of decision points; a knowledge base, said knowledge base including a plurality of first images, each of said plurality of first images illustrating one of said first responses; and a user interface for presenting said plurality of queries and said illustrative first images to a user, the method comprising the steps of:

- a) receiving at least one of said plurality of queries and said at least first response and said second response;
- b) viewing one of said plurality of first images illustrating said at least first response;
- c) selecting between said first response and said second response based on said one of said plurality of first images; and
- d) repeating steps a-c until said resolution point is reached.

11. The method of claim 10, wherein said knowledge base includes a plurality of second images, each of said plurality of second images illustrating one of said second choices, said method further comprising the steps of:

- viewing one of said plurality of second images illustrating said second response; and
- selecting between said first response and said second response based on said one of said plurality of second images.

12. The method of claim 10, wherein said knowledge base includes a diagnostic image illustrating said diagnosis of said fault, wherein said step of repeating steps a-c until said resolution point is reached further comprises the step of:

viewing said diagnostic image.

13. The method of claim 10, wherein said knowledge base includes a resolution of said fault, said method further comprising the step of:

presenting said resolution of said fault.

14. The method of claim 10, wherein said knowledge base includes a description of said fault, said method further comprising the step of:

presenting said description of said fault.

ABSTRACT

A method and system for diagnosing a fault that includes a decision tree having a plurality of decision points wherein at least some of the plurality of decision points terminate in a resolution point representing a diagnosis for the fault. Also included is a plurality of queries each having at least a first response and a second response where each of the plurality of queries being associated with one of the plurality of decision points. The system also includes a knowledge base that includes a plurality of first images where each of the plurality of first images illustrate one of the first responses. A user interface is included for presenting the plurality of queries and the illustrative first images to a user. The user navigates the decision tree by responding to at least some of the plurality of queries by viewing the illustrative first images and basing a selection between the first response and the second response associated with said at least some of said queries on said illustrative first images. Finally, the fault is diagnosed when the user navigates the decision tree until the resolution point is reached.

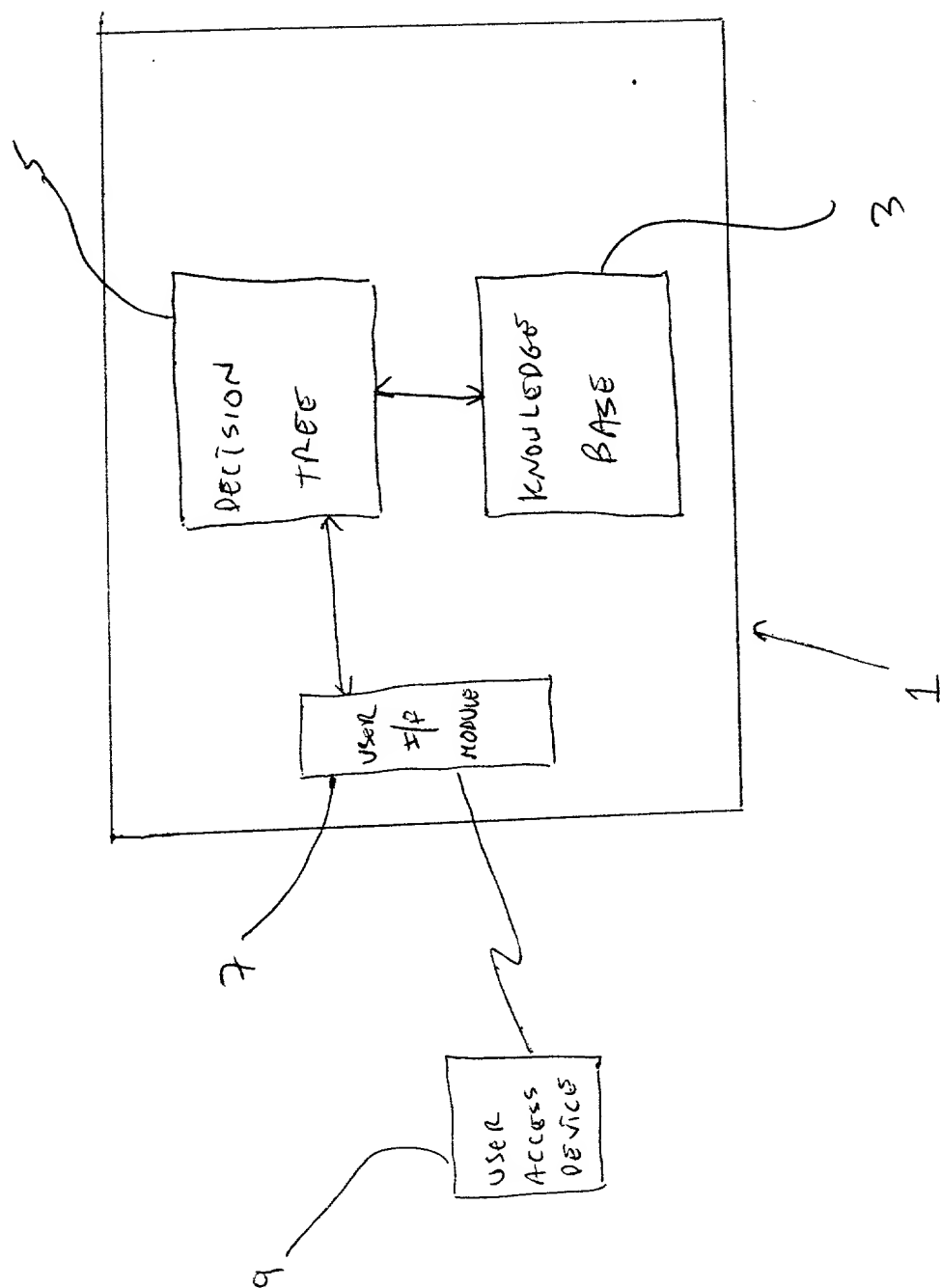


FIG. 1

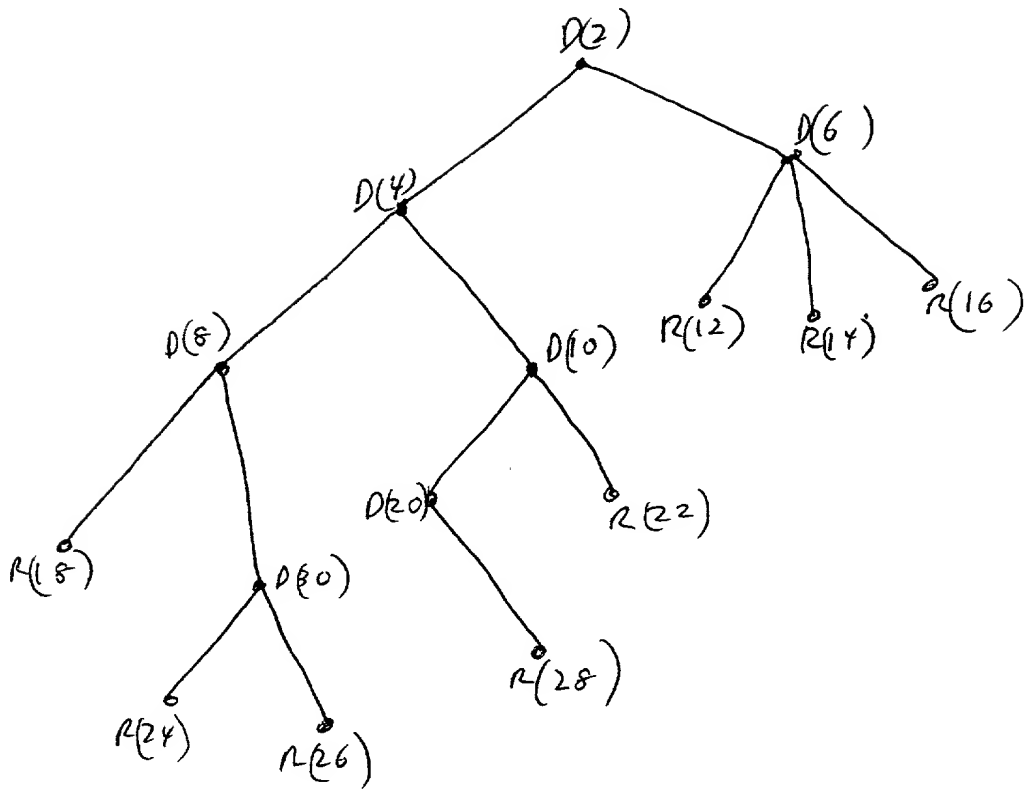


FIG-2

- ☐ Blockage or Debris Void
- ☒ Rim Void
- ☐ Resist Lock in Void
- ☐ Resist Plug Void
- ☐ Electroless Bubble Void
- ☐ Thin Electroless Void
- ☐ Etchout Void
- ☐ Electrolytic Bubble Void

A void condition usually caused by a layer of dry film residue at the knee of a hole during electrolytic copper plating. This is dissimilar to the Dry Film Lock-in type of void. The dry film debris or residue that causes a rim void manifests itself at the knee of a hole and is visible from the surface of the



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FIG. 3

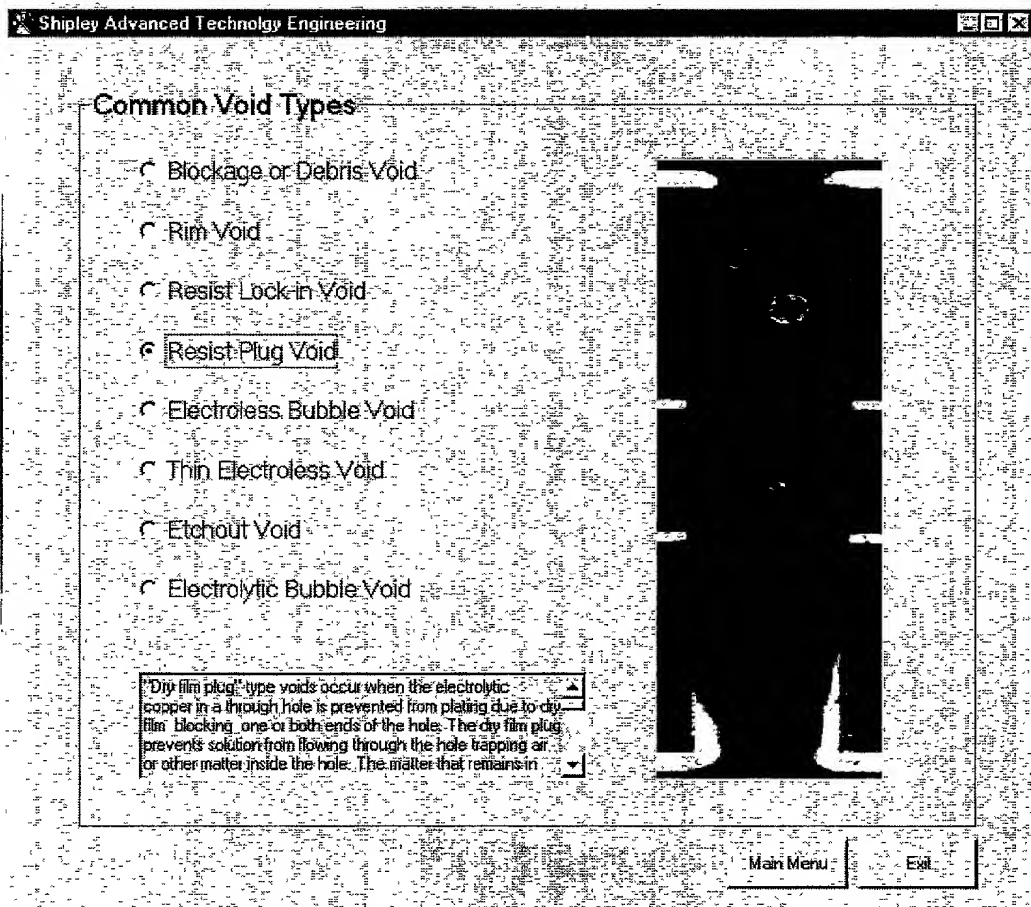


FIG. 4

Shipley Ronal Advanced Technology Engineering

Process Description / Purpose Potential Failure Mode(s) Potential Effect(s) of Failure Severity Potential Cause(s) of Failure Occurrence Current Controls
Detection Risk Priority Number (RPN) Recommended Action(s) Process FMEA Checklist Main Menu Print Failure Modes Exit

Potential Failure Modes

☒ Voids ☐ ICDs ☐ Poor Adhesion ☐ Other

Selection Criteria / Potential Failure Modes

Etchout Voids
Resist Lock-in Voids
Resist Plug Voids
Debris / Blockage Voids
Thin Electroless Voids
Glass Area Voids

Potential Causes of Failure

1. Clogged dry film develop nozzles
2. Insufficient dry film develop filtration
3. Develop sump cleaning procedure / frequency
4. Insufficient pre-plate cleaner concentration
5. Insufficient pre-plate cleaner temperature
6. Insufficient pre-plate cleaner dwell

Potential Effect(s) of Failure

Electrical Functionality
Poor Continuity
System Reliability

Recommended Actions

Verify the proper cleaner dwell was utilized. Automatic hoist systems' timeways should be checked periodically. Changes are sometimes incorporated without full understanding of other tank dwells

Suggested Controls

Process Control Plan
Equipment Preventive Maintenance Program
Operator Start-up Checklist
Operator Shut-down Checklist
Control Charts for Key Variables
Control Charts for Key Attributes

Relative FMEA Indices

Severity	8	Detectability	3
Occurrence	2	Risk Priority Number	48

FIG. 5

Declaration and Power of Attorney for Patent Application English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

VIRTUAL ENGINEER

the specification of which

(check one)

<input checked="" type="checkbox"/>	is attached hereto.	
<input type="checkbox"/>	was filed on	as United States Application No. or PCT
	Application No.	
	and was amended on	
		(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)	<u>Priority Not Claimed</u>
(Number) (Country) (Day/Month/Year Filed)	[]
(Number) (Country) (Day/Month/Year Filed)	[]
(Number) (Country) (Day/Month/Year Filed)	[]

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U.S.C. Section 120 of the United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark office all information known to me to be material to patentability as defined in Title 37, C.F.C., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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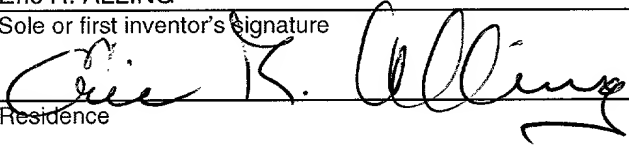
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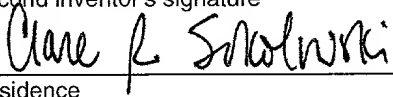
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